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The Patent Office

PCT/GB 99/03142

22 SEPTEMBER 1999

INVESTOR IN PEOPLE

GB 99/3142 EU 09786842

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed J Evans.

Dated 19 October 1999

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Request for the grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference

RSJ05937GB

2. Patent application number
(The Patent Office will fill in this part)

9820830.9

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Madge Networks Limited
100 Lodge Lane
Chalfont St. Giles
Bucks
HP8 4AH

6001

Patents ADP number *(if you know it)*

04410865001

If the applicant is a corporate body, give the country/state of its incorporation

Great Britain

4. Title of the invention

COMMUNICATION NETWORK

5. Name of your agent *(if you have one)*

GILL JENNINGS & EVERY

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Broadgate House
7 Eldon Street
London
EC2M 7LH

Patents ADP number *(if you know it)*

745002

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor

b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body.

See note (d))

YES

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	3
Claim(s)	
Abstract	
Drawing(s)	

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. For the Applicant
Gill Jennings & Every

I/We request the grant of a patent on the basis of this application.

Signature [signature] Date 24 September 1998

12. Name and daytime telephone number of person to contact in the United Kingdom

SKONE JAMES, Robert Edmund
0171 377 1377

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.*

b) *Write your answers in capital letters using black ink or you may type them.*

c) *If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.*

d) *If you have answered 'Yes' Patents Form 7/77 will need to be filed.*

e) *Once you have filled in the form you must remember to sign and date it.*

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COMMUNICATION NETWORK

The Spanning Tree Protocol (STP) is a method described in the IEEE 802.1D standard for controlling bridging paths through a network. To avoid problems caused by bridging loops in the network, this protocol temporarily eliminates loops by disabling ports so that for the transmission of a data packet across the network there is only one possible path for that particular packet. In general, this protocol aims also to create a path that is that most efficient and typically has a higher bandwidth than alternatives. The protocol operates in a cascading fashion, whereby a root switch determines sequentially which of the other switches in the network offers the best route. Thus switches nearest to the root switch are "elevated" sooner than those further away. It is possible, theoretically, owing to the presence of the loops in the network, that as a result of this process a port of a switch may become disabled when that port would otherwise offer a better route into the switch. This possibility becomes significant in the context explained below.

In order to improve the effectiveness of switches (or multi-port bridges) which link small networks together, it is desirable to maximise the number of ports in the switch. A simple way to do this is to stack a number of switches together, connected by a high bandwidth bus which is unique to those switches and does not have any other links to anything else. For example, a number of 24-port switches may be stacked so as to make effectively a 48-, 72-... up to a 192-port switch. Of course, a single 192-port switch could be made, but this would be inflexible and expensive. Commercial considerations dictate that a number of linked small modules is more sensible than a single large unit. Although the high bandwidth bus is not connected to anything other than the switches in the stack, it is nonetheless connected to each switch via a port, and that port may be temporarily disabled, like any other, by the standard STP as described above.

In a typical single multi-port switch, the resident processor implements the standard STP to control routing. When a number of switches are linked in a stack as described above, each switch may try to implement the STP, but the presence of loops in the network structure may lead to ports at which the switches are connected to the high bandwidth bus becoming disabled by the operation of the STP as described above. Thus the data packets, instead of being routed over a short, high bandwidth, "dedicated" internal link, are instead passed via other switches and other parts of the network external to the switch stack. Clearly this is inefficient and undesirable for a number of reasons. One method of solving this problem is to designate the processor of one of the switches in the stack to act for every port on all the switches, thereby making the STP function of all the other processors on all the other switches redundant. Additionally, this creates a disproportionately high workload for the one processor. Furthermore, this approach requires that the one processor controlling all the ports on all the switches must have information about each of those ports, so that if a new switch is added to the stack, the "master" processor must be provided with information about the new switch.

The invention herein is a modification to the standard STP, which enables each processor in each switch to function broadly as before, but with routing criteria which would disable ports outside the stack in preference to those ports linking stack switches directly to the high bandwidth bus. This ensures that the high bandwidth internal bus is always full enabled, and each switch is always in direct contact with every other switch in the stack. To external devices connected to any of the other ports of any of the switches, the switch stack appears and functions as though it were the single monolithic switch described earlier. Thus each switch within the stack has the same switch ID, and each port in the stack has its own unique port ID not duplicated elsewhere in the stack. Any

number of new switches may be added, up to the limits of the system, and these may have the same or a different number of ports as the switches already in the stack. Because each switch has its own resident processor operating the modified STP, no switch already on the stack has any need to know anything about any other switch newly added to the stack - such as the number of ports therein. Additionally, the work load on the processors within the switches is balanced, with no one processor carrying a disproportionate loading.

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